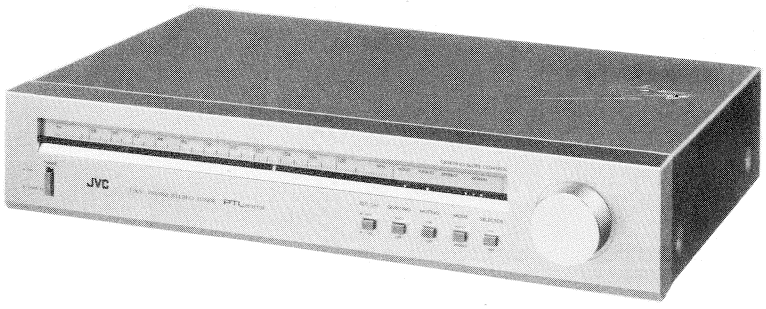
JVC

SERVICE MANUAL

MODEL
T-X5
FM/AM STEREO TUNER



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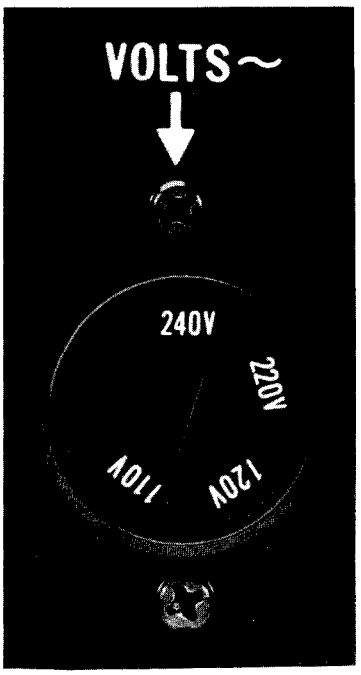


This SET is switchable to the line voltage of 110, 120, 220 and 240 volts AC; 50/60 Hz.
The changeover switch is placed on the rear panel of the set.
To select another voltage, turn the changeover switch with a screwdriver or coin.

But for the U.S.A. and Canada, the set has no changeover switch, and fixed only for the 120 volts AC; 50/60 Hz.

Warning!
When replacing the parts marked with ⚠ in the schematic diagram, be sure to use the designated parts to ensure safety.

1. Specifications

FM TUNER SECTION

Tuning range	: 87.5 MHz – 108 MHz
Usable sensitivity	: 0.9 μV/75 Ω (10.3 dBf)
50 dB S/N sensitivity	: Mono 1.8 μV/75 Ω (16.3 dBf)
	Stereo 8.7 μV/75 Ω (30.0 dBf)
Signal to noise ratio	: Mono 81 dB
	Stereo 78 dB
Distortion at 100 Hz	: 0.10 % (Mono), 0.15 % (Stereo)
at 1 kHz	: 0.08 % (Mono), 0.10 % (Stereo)
at 6 kHz	: 0.15 % (Mono and Stereo)
Intermodulation distortion	: 0.05 % (Mono), 0.08 % (Stereo)
Capture ratio	: 1.0 dB
Alternate channel selectivity	: 65 dB
Image rejection	: 90 dB
IF rejection	: 100 dB
Spurious rejection	: 100 dB
RF intermodulation rejection	: 70 dB
AM suppression	: 65 dB
Stereo separation at 100 Hz	: 45 dB
at 1 kHz	: 50 dB
at 10 kHz	: 40 dB
Subcarrier rejection	: 70 dB
Stereo threshold level	: 3.2 μV/75 Ω (21.3 dBf)
Muting threshold level	: 3.2 μV/75 Ω (21.3 dBf) (Mono and Stereo)
Frequency response	: 50 Hz – 10 kHz ±0.3 dB, 30 Hz – 15 kHz +0.3 dB, -0.8 dB
De-emphasis	: 50 μsec/75 μsec
Output level	
Variable output	: 0 V – 1.0 V/2.5 kΩ
Fixed output	: 560 mV/2.5 kΩ
Recording level	: equivalent to 50 % frequency modulation
Antenna input impedance	: 75 Ω unbalanced

AM TUNER SECTION

Tuning range	: 525 kHz – 1605 kHz
Usable sensitivity	: 300 μV/m (bar antenna) 50 μV (ext. antenna)
Total harmonic distortion	: 0.5 %
Signal to noise ratio	: 50 dB
Selectivity	: 45 dB
Image rejection	: 45 dB
IF rejection	: 45 dB
Spurious rejection	: 45 dB
Output level	
Variable output	: 0 V – 0.6 V/2.5 kΩ
Fixed output	: 350 mV/2.5 kΩ
DIMENSIONS	: 8.9 cm(H) x 45.0 cm(W) x 36.4 cm(D) (3-8/16" x 17-3/16" x 14-4/16")
WEIGHT (net)	: 5.0 kg (11.0 lbs.)

Design and specifications subject to change without notice.
Specifications in FM Tuner section are based upon IHF standard.

POWER SPECIFICATIONS

Designated Areas	Line Voltage & Frequency	Power Consumption
U.S.A.	AC 120 V, 60 Hz	9 W
CANADA	AC 120 V, 60 Hz	9 W
U.K., AUSTRALIA	AC 240 V∿, 50 Hz	9 W
CONTINENTAL EUROPE	AC 220 V∿, 50 Hz	9 W
OTHER AREAS	AC 110/120/220/240 V Selectable, 50/60 Hz	9 W

2. Explanation of New Technology

2-(1) Phase Tracking Loop (PTL) FM Discriminator

A variety of circuitries have been applied to discriminators and various type of tuners incorporating these discriminators have been marketed. Progress is being made in circuit integration of the discriminator and IF limiter portion as the IC to secure their stability and reliability. The quadrature discriminator is mainly employed for such ICs because of its stability and productivity today. Common ICs currently on the market are basically designed for quadrature type.

In the development of the tuner, unlike other audio equipment, stress is laid on raising the degree of harmony between high fidelity and selectivity. One solution to this dilemma is to make the selectivity manually switchable between "narrow" and "wide". However it is not a direct solution to improving the degree of harmony but it seems marketably acceptable.

The main emphasis in developing a tuner is to devise a discriminator circuit that is provided with both wide frequency response and high interference rejection capability. Several approaches have been made toward reaching this ultimate goal.

JVC has already succeeded in developing the high performance PLL (Phase Locked Loop) discriminator that is scarcely affected by variations in environment or in aging. The tuner incorporating the PLL discriminator has been made available to the general public as a proposal of a course for development of tuner circuit. The recent development of the PTL (Phase Tracking Loop) discriminator pursues this prescribed course. The PTL discriminator, incorporated within the T-X5, functions as described below.

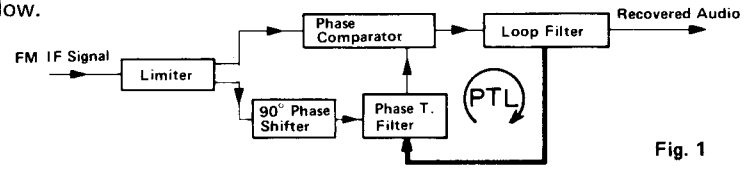


Fig. 1

The input signal to the discriminator is the FM IF signal (10.7 MHz). As shown in Fig. 1, it first enters the limiter that trims the signal amplitude components. The limiter's output is divided into two paths: one directly goes to the phase comparator, the other passes the 90 degree phase shifter and tracking filter and enters the phase comparator. The phase comparator compares the phases of the two signal components and produces an error voltage in accordance with the phase difference detected.
The loop filter separates the desired components from the error signal that includes high frequency components such as the IF or its harmonics. The loop filter's output is the recovered signal which is delivered to the following MPX decoder. At the same time the recovered signal from the loop filter drives the phase tracking filter so that its center frequency follows the phase variation of the FM input signal.

The loop formed by the phase comparator, loop filter and phase tracking filter is called the PHASE TRACKING LOOP (PTL).

The phase-tracking response of the loop to the input signal is improved as the loop gain is raised. When the delay of the response is reduced ultimately to zero, the circuit becomes the Phase Locked Loop (PLL).
As the loop gain is reduced, on the contrary, the delay of the response to phase changes of the input signal increases. When the phase tracking loop becomes insensitive to phase changes, the circuit operates as the Quadrature discriminator. These different configurations are shown in Fig. 2.

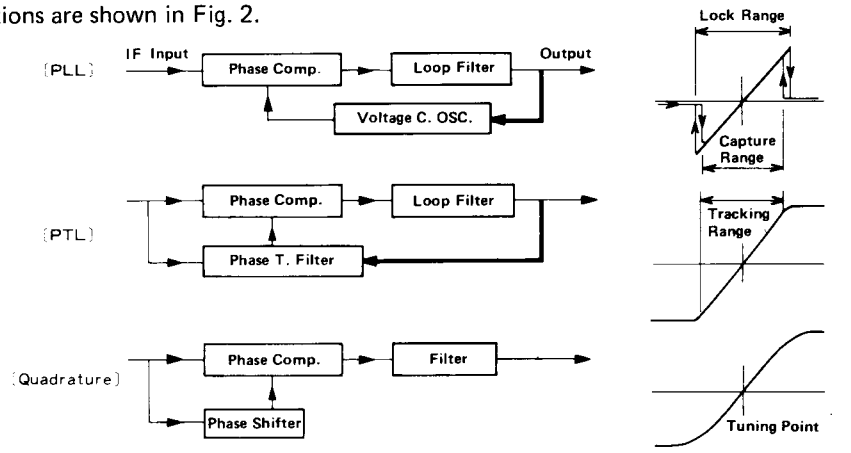


Fig. 2

Thus the PTL discriminator, taking the middle of the road between the PLL and Quadrature, can be converted to any of the discriminator by varying its loop gain.
And the PTL has a advantage other than the PLL discriminator, which is no oscillator incorporated, so that no noise source is included in the loop and no affection of its harmonics to the preceding stage of the tuner. The level of noise entering the phase comparator will be reduced by making the resonance curve of the tracking filter steep. Stable and high performance can be obtained by optimizing the loop gain.

The features of the PTL discriminator summarized below:

*High signal to noise ratio and low distortion.
Since the linearity of discrimination (differential gain characteristics) is determined by the loop response, this discriminator can operate with high S/N and low distortion in a wide range merely because its tracking filter is suitably designed.

*Stable FM demodulation
The feedback loop secures stable operation over a long period, maintaining a well tracking condition by absorbing variations due to changing temperature and aging.

*Signal to noise ratio improved for weak input
The FM threshold level is improved because of its feedback operation, and the S/N is high even when the input signal is weak.

*Excellent interference rejection
The combination of the loop filter and tracking filter is excellent in eliminating interference.

*Excellent AM suppression
The capability of AM suppression is proportional to the response of loop. AM components generated by interference or multipath distortion will be suppressed.

2-(2) RF Stage Consisting Cascode-Connected FETs in Parallel

Fig. 9 shows the cascode connected FETs with the source of the input FET (Tr1) grounded and the gate of the output FET (Tr2) grounded. Connected in this way they act as an impedance transformer. This type of cascode connection of FETs is made possible using MOS FETs; called "dual-gate MOS FETs." Junction FETs will have improved characteristics if used in cascode connection.

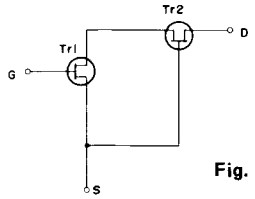


Fig. 3

Features of cascode connection are:
(1) High input impedance
(2) Low noise factor
(3) Excellent intermodulation and spurions response characteristics
(4) High stability and no need of neutralization

Neutralization is not required because the feedback capacity (Crss) of cascode connected FETs is very low (about 0.1 pF). Since reverse transmission admittance is very low, undesirable oscillations are largely suppressed. Cascode FETs with these desirable characteristics can be connected in parallel to give greatly improved sensitivity.
In the MC head amplifier in audio circuits, parallel connected bipolar transistors are used to reduce rbb while single-gate J-FETs are used to increase gm. The degree of improvement is given by $20 \log 1/\sqrt{n}$ dB where "n" is the number of units connected in parallel. In an RF amplifier, however, the feedback capacity Crss mentioned above and feedback through the air must be taken into consideration. Crss and gm will improved by parallel connection, but response will be degraded because the input will be reduced with too many units connected in parallel. For this reason, two units are used connected in parallel in the T-X5.

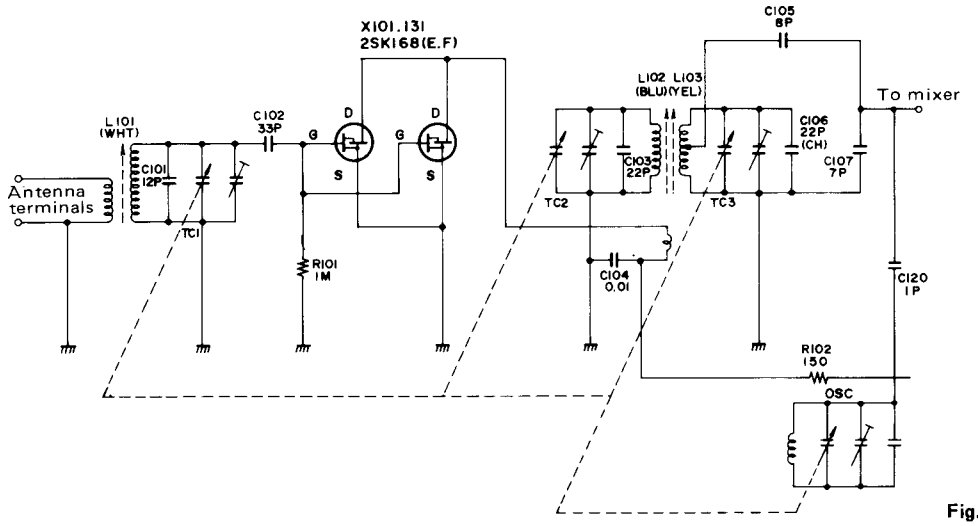


Fig. 4

Parallel connection of cascode FETs

2-(3) Quieting Slope Control Circuit

Weak broadcast stereo signals cannot normally be reproduced with high quality because of noise. The reason is that the signal-to-noise ratio is reduced by a theoretical value of 21.7 dB during stereo reception when compared with mono reception.
This problem is solved by using a HI BLEND MPX filter which reduces the noise level when stereo broadcast signals are weak. This filter remains in the signal path regardless of intensity of the signal unless the HI BLEND switch is OFF and causes the crosstalk to deteriorate. The newly developed Quieting Slope Control (QSC) circuit automatically varies the amounts of the signals blended, according to the input signal level, to improve the -50 dB quieting sensitivity by 6 dB when the AUTO position is selected. The QSC circuit will be automatically cut off when the AUTO position is selected if the signal strength indicator exceeds about "3", i.e. in areas where the signal strength is sufficient. This facility makes it possible to always optimize reception by simply selecting the AUTO position.

Block diagram

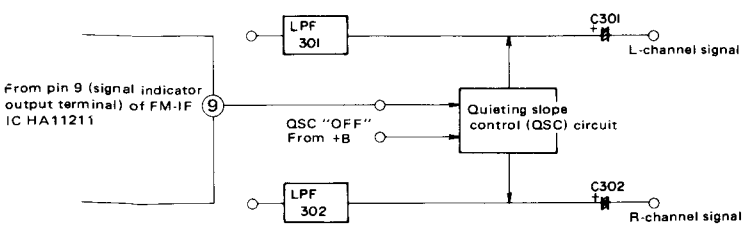


Fig. 5

Comparison of characteristics

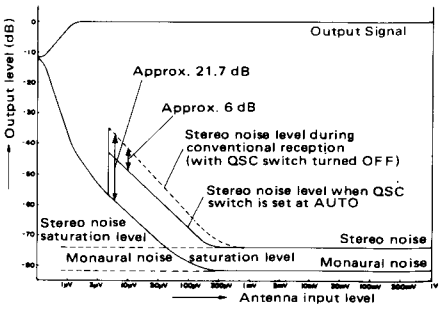


Fig. 6

2-(4) Auto Tuning Hold Circuit

Referring to the block diagram Fig. 7, the Auto Tuning Hold circuit operates in the following way:

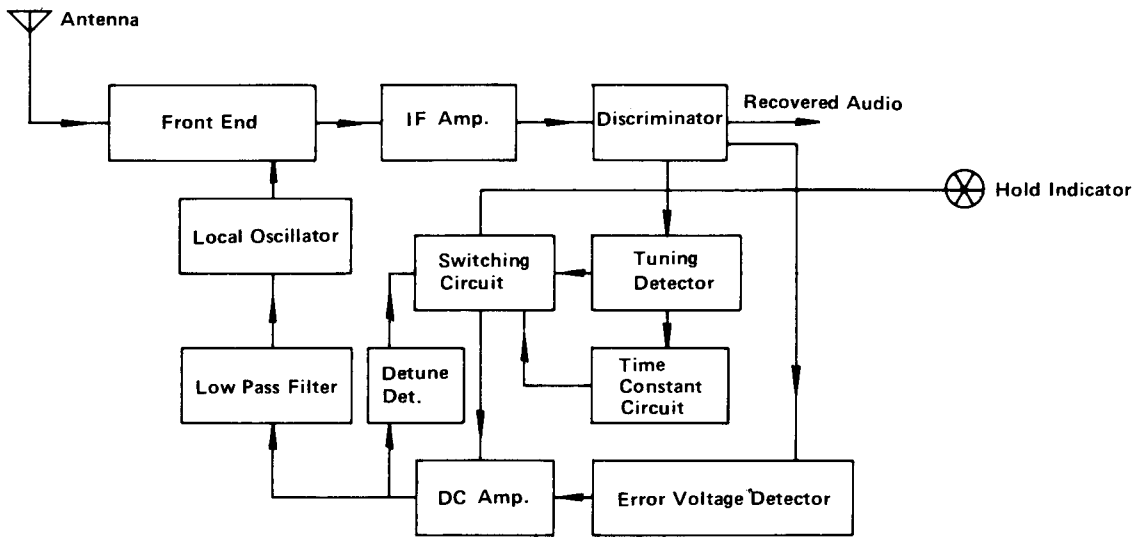


Fig. 7

When the tuner has been tuned to a desired station, the discriminator delivers a detection signal which swings tuning meter. The tuned-state detecter switches to "hold" with a delay determined by the time constant circuit, and it turns DC amplifier on. This amplifies the error voltage generated from the discriminator's output. The bandwidth of the error voltage will be limited by the detector. The low pass filter will pass the DC component to drive the local oscillator. Thus the auto tuning hold circuit not only keeps the tuner from drifting out of tune but facilitates tuning operation. Fig. 8 compares the operating characteristics of ordinary tuning, conventional AFC and Tuning Hold circuit operations.

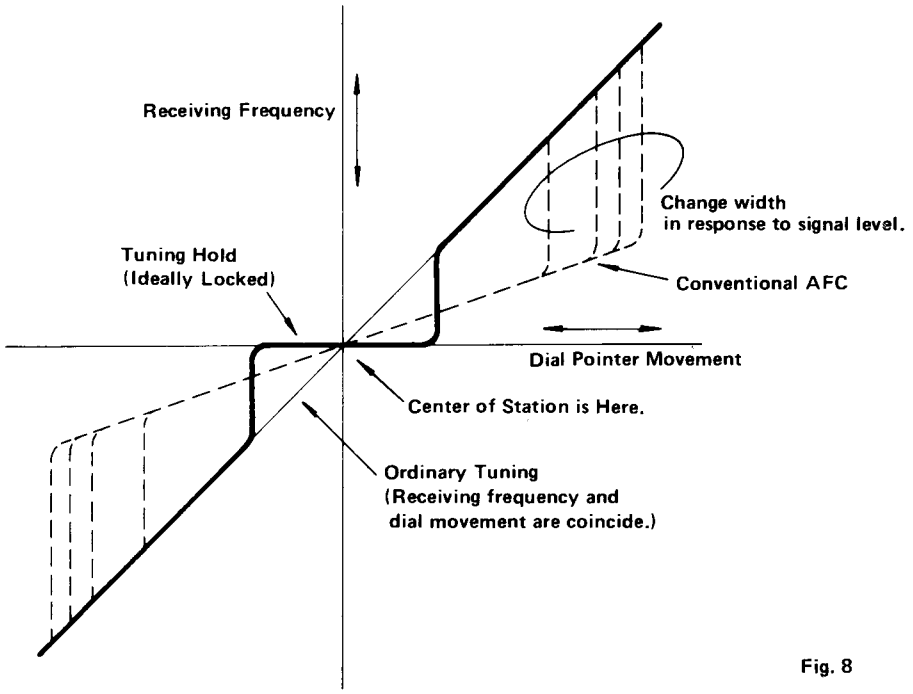


Fig. 8

When the circuit is activated continuously, it is somewhat difficult to tune in precisely to a desired frequency. The auto tuning hold circuit is automatically activated one moment after precise tuning is completed. When detuning the tuner, the tuning hold circuit will be deactivated. The operational feeling of tuning is therefore that of ordinary tuning.

3. Main Parts Location and Part Numbers

Top View

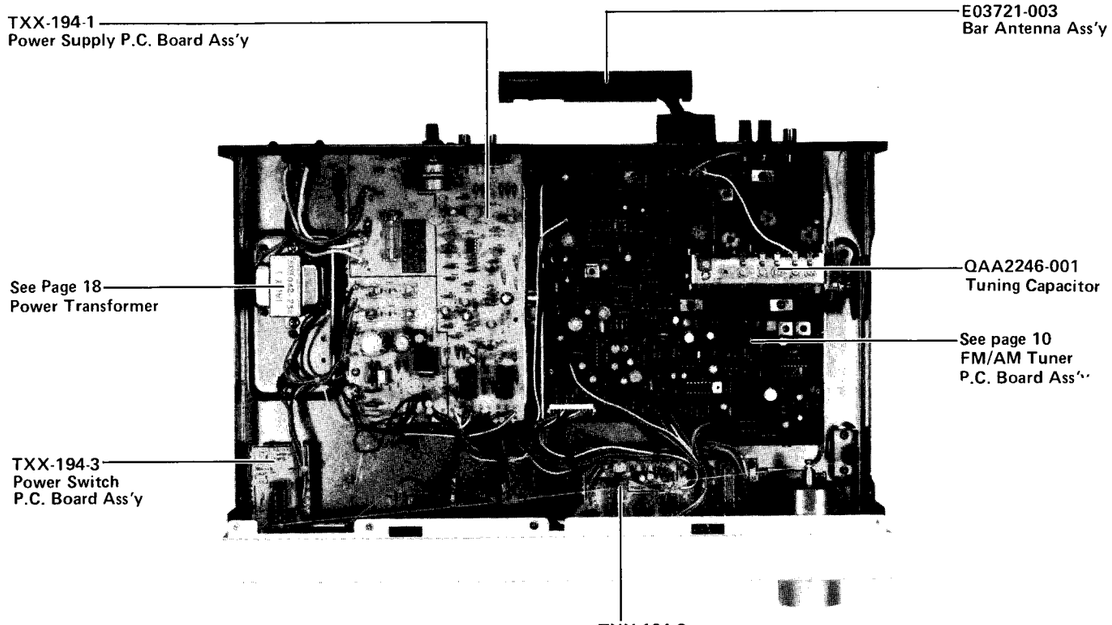


Fig. 9

Front View

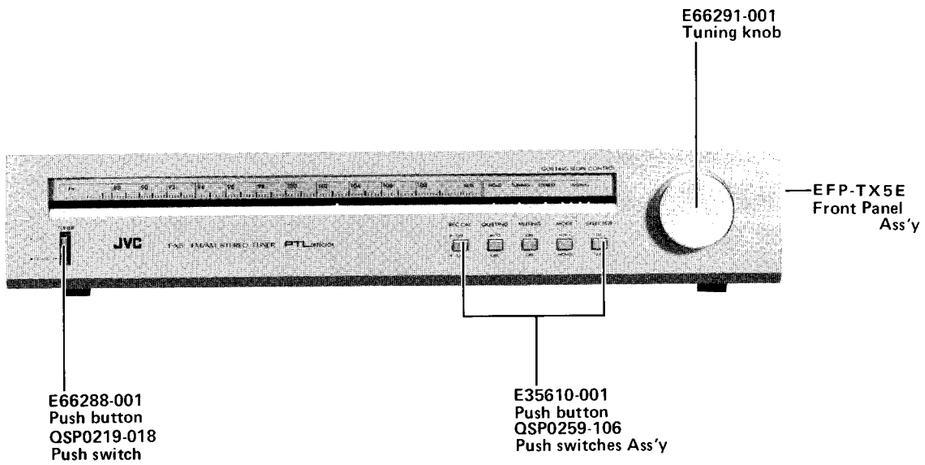


Fig. 10

4. Dial Stringing Procedures

Turn the tuning capacitor so that its plates are completely closed (maximum capacity) first. Then start dial stringing following the diagram below.

In following the 3 procedures in the diagrams, I put the string through the spring loop, II tie the string in a knot having an indicated remaining length, finally III begins to string the dial following the 1, 2, 3 . . . sequence in diagram as shown.

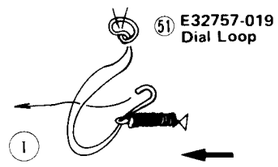


Fig. 11

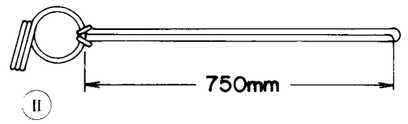


Fig. 12

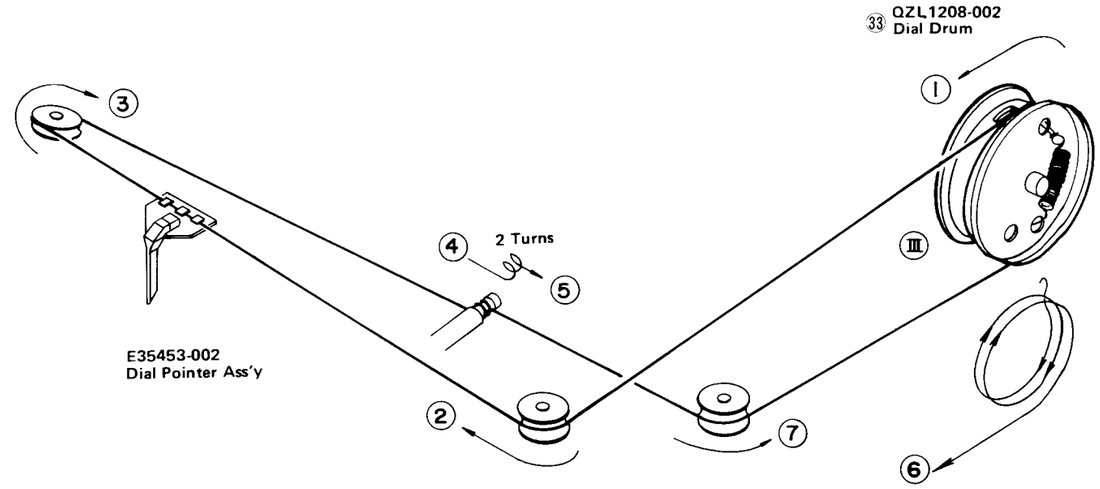


Fig. 13

5. Exploded Views and Removal Procedures

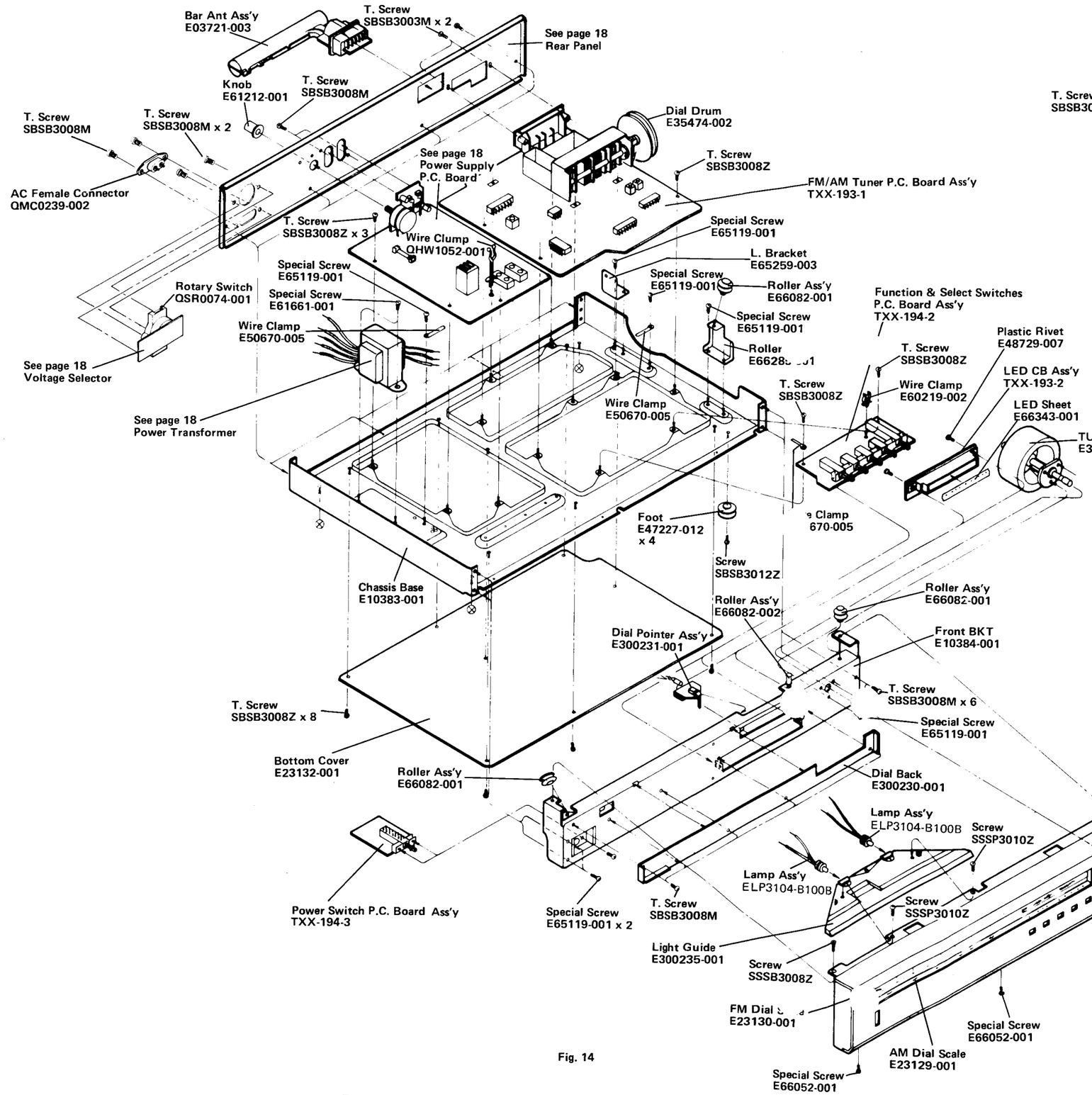
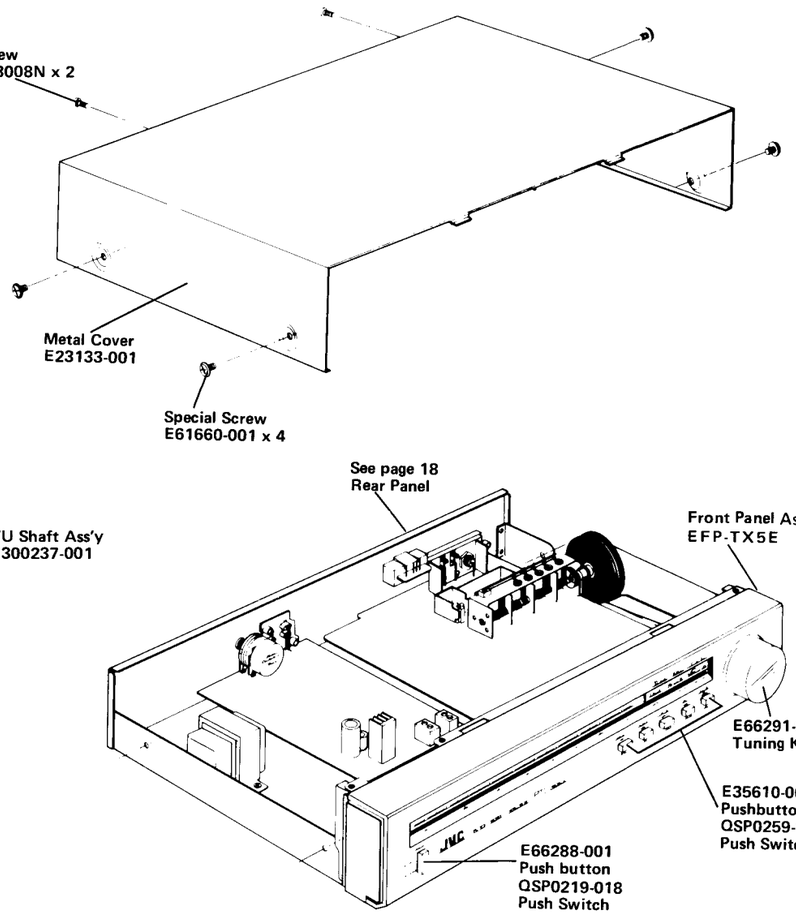


Fig. 14



1. Untighten the set screw of the tuning knob by the use of hexagonal wrench turning counter-clockwise.
2. Slowly pull the tuning knob forward to remove.

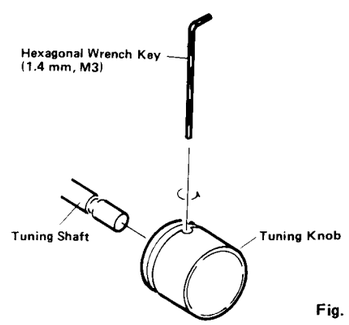


Fig. 15

6. FM/AM Tuner Alignment Procedures

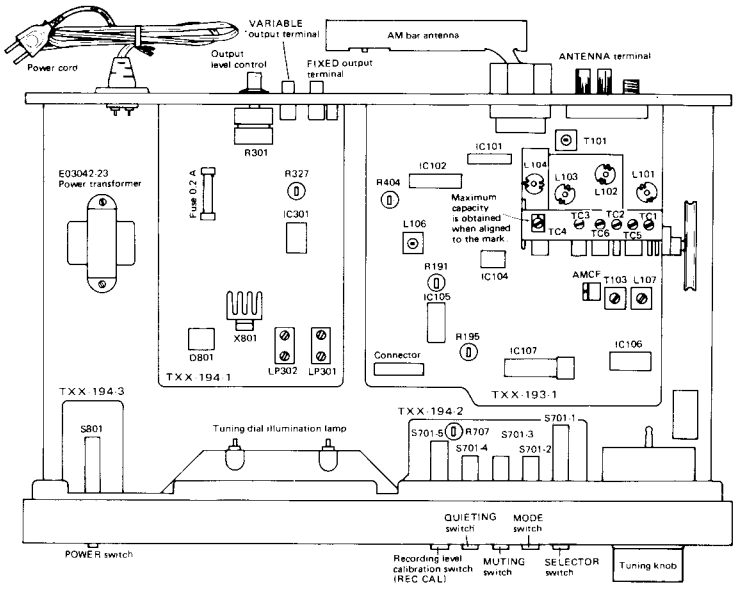


Fig. 16

6-(1) Frontend Section

L104 FM oscillator tuning coil:
Adjust the coil so that a 88 MHz signal can be received when the dial pointer indicates 88 MHz.
TC4 FM oscillator tuning trimmer:
When the dial pointer indicates 108 MHz, adjust the tuning trimmer so that the set receives a 108 MHz signal.
L101 FM ANT tuning coil:
L102 FM RF1 tuning coil:
L103 FM RF2 tuning coil:
} Maximize the sensitivity at 90 MHz.
TC1 FM ANT tuning trimmer:
TC2 FM RF1 tuning trimmer:
TC3 FM RF2 tuning trimmer:
} Maximize the sensitivity at 106 MHz.
T101 FM IFT: Maximize the sensitivity with the weak antenna input.

6-(2) FM Section

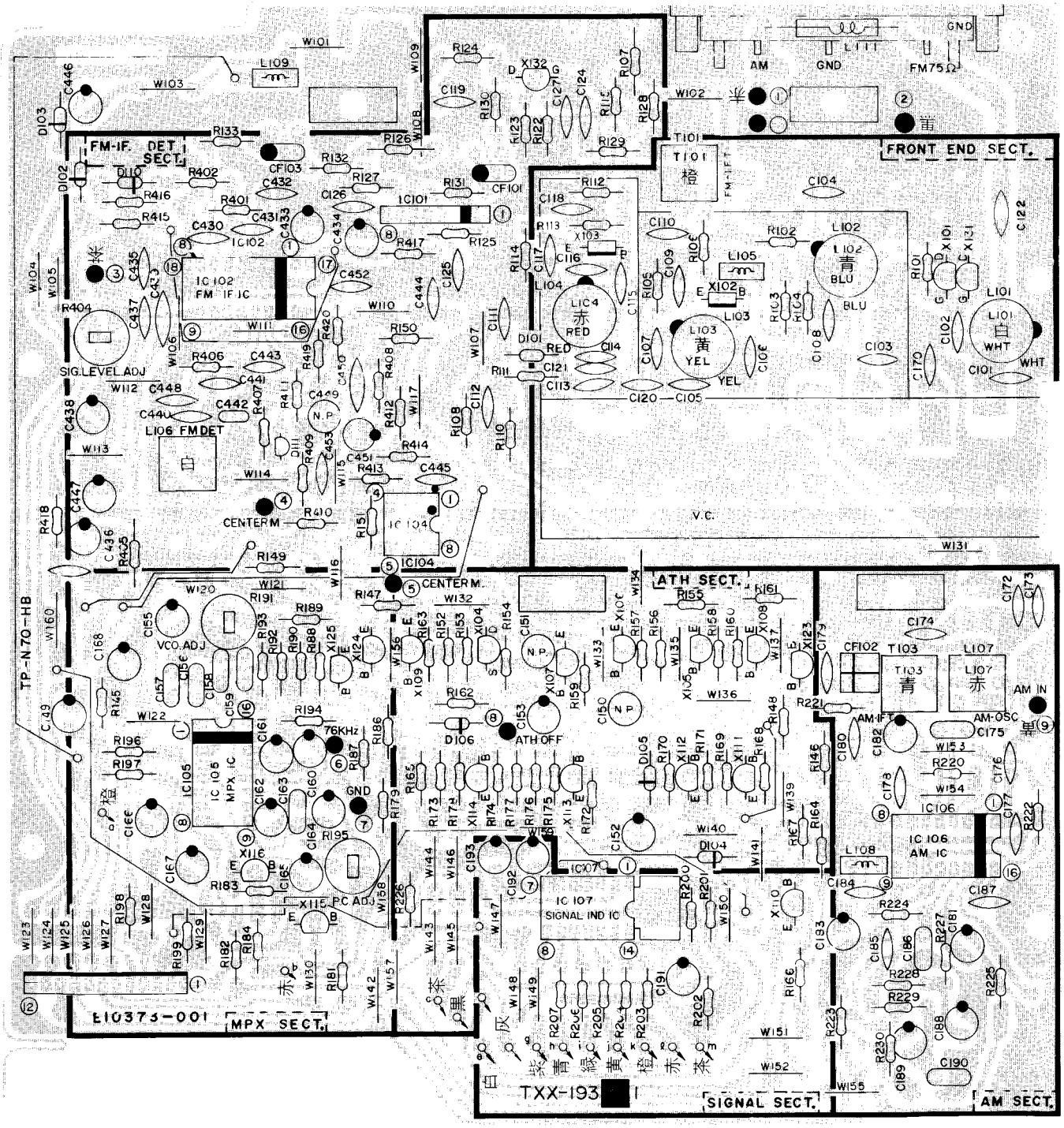
L106 FM tracking filter:
Connect the center meter to TP 4 and 5 and adjust L106 for the center meter reading of "0" (zero).
R191 MPX VCO free-run frequency adjusting resistor:
Adjust the variable resistor so that the free-run frequency becomes 76 kHz at the test point.
R195 MPX pilot cancel adjusting resistor
Receiving a stereo signal, adjust the variable resistor so that leakage of the pilot signal component (19 kHz) to the output is minimized.
LPF301 and **302** MPX low-pass filters:
Adjustment is not required since they are preadjusted and leakage of the subcarrier in the output signal is minimized.
R327 stereo separation adjusting resistor:
Adjust it so that the channel separation becomes maximum.
R707 oscillator output adjusting resistor:
Adjust it so that the output level of the oscillator as the recording reference level (approx. 333 Hz) becomes equal to the output level of a 50-percent modulated FM signal.
R404 Signal indicator adjusting resistor:
Set an RF generator to output level 55 dB and then adjust R404 so that Signal Indicator light at proper level "5".

6-(3) AM Section

L107 AM oscillator tuning coil:
Adjust it to receive a 600 kHz signal when the dial pointer indicates 600 kHz.
TC6 AM oscillator tuning trimmer:
Adjust it to receive a 1 400 kHz signal when the dial pointer indicates 1 400 kHz.
L1 AM bar antenna coil: Maximize the sensitivity at 600 kHz.
TC5 AM antenna tuning trimmer:
Maximize the sensitivity at 1 400 kHz.
T103 AM IFT:
Adjustment is not required since it is preadjusted.
Maximize the IF gain.

7. Printed Circuit Board Ass'y and Parts List

7-(1) TXX-193B (or) FM/AM Tuner and LED P.C. Board Ass'y



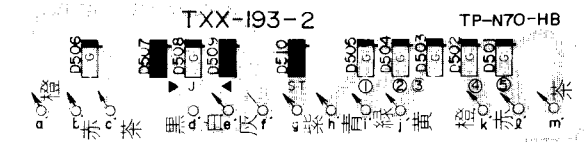
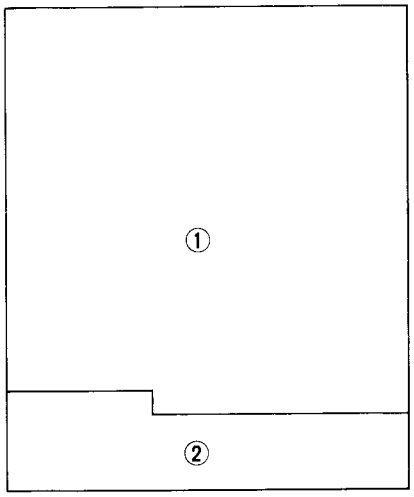


Fig. 17

The number of TXX-193 □ -1 FM/AM Tuner P.C. Board Ass'y varies according to the area employed.
Location:



TXX-193 □ -1 : FM/AM Tuner P.C. Board Ass'y
TXX-193-2 : LED P.C. Board Ass'y

Note:

1. In □ should be indicated B or C according to the table below when placing an orde.
2. The specific symbols (赤, 黒, 白 ... etc.) on a surface of P.C. Board are actually un-related to the repair service and are significant denotement in order to process the proper assembly of P.C. Board at the factory.

Designated Area	P.C. Board Ass'y
For U.S.A., Canada, U.S. Military Market and Other Countries	TXX-193 B -1
For Europe, U.K. and Australia	TXX-193 C -1

Transistors

Item No.	Part Number	Rating		Description	Maker
		Pc	fT		
X101	2SK168(E, F)	0.2 W		J. FET	Hitachi
X102	2SC535(C)	0.1 W	940 MHz	Silicon	"
X103	2SC461(C)	0.2 W	230 MHz	"	"
X104	2SK105(E, F)	0.25 W		J. FET	NEC
X105	2SA1029(D)	0.2 W	200 MHz	Silicon	Hitachi
X106	2SC458(D)	"	230 MHz	"	"
X107	2SA1029(D)	"	200 MHz	"	"
X108	2SC458(D)	"	230 MHz	"	"
X109	2SC458(D)	"	"	"	"
X110	2SC458(D)	"	"	"	"
X111	2SC458(D)	"	"	"	"
X112	2SC458(D)	"	"	"	"
X113	2SC458(D)	"	"	"	"
X114	2SC458(D)	"	"	"	"
X115	2SC458(D)	"	"	"	"
X116	2SC458(D)	"	"	"	"
X123	2SC458(D)	"	"	"	"
X124	2SC458(D)	"	"	"	"
X125	2SC458(D)	"	"	"	"
X131	2SK168(E, F)	"		J. FET	"
X132	2SK168(E, F)	"		"	"

Integrated Circuits

Item No.	Part Number	Rating	Description	Maker
		Pc		
IC101	HA1211	0.2 W	I.C.	Hitachi
IC102	HA11211	0.73 W	"	"
IC104	NJM4558D	0.5 W	"	JRC
IC105	HA11223W	"	"	Hitachi
IC106	HA1197	0.45 W	"	"
IC107	LB1416S	1.3 W	"	Tokyo Sanyo

Diodes

Item No.	Part Number	Rating	Description	Maker
D101	1S2687		Variable Capacitance	JRC
D102	1S2076-31		Silicon	Hitachi
D103	1S2076-31		"	"
D104	1S2076-31		"	"
D105	1S2076-31		"	"
D106	1S2076-31		"	"
D110	1S2076-31		"	"
D111	FC64M(L)		Variable Capacitance	Fujitsu
D501	LN321GP		LED	Matsushita
D502	LN321GP		"	"
D503	LN321GP		"	"
D504	LN321GP		"	"
D505	LN321GP		"	"
D506	LN321GP		"	"
D507	LN221RP		"	"
D508	LN321GP		"	"
D509	LN221RP		"	"
D510	LN221RP		"	"

Coils & Transformers

Item No.	Part Number	Rating	Description
L101	E03477-31		FM ANT. (White)
L102	E03477-053		FM RF (Blue)
L103	E03477-054		FM RF (Yellow)
L104	E03477-055		FM OSC. (Red)
L105	E03522-1R5KY	1.5 μH	Choke Coil
L106	E03078-47		Detector Coil (White)
L107	E03079-29		AM OSC. Coil (Red)
L108	E03522-391KY	390 μH	Choke Coil
L109	E03522-391KY	390 μH	"
T101	E03078-46		FM IFT (Orange)
T103	E03613-005		AM IFT (Blue)

Capacitors

Item No.	Part Number	Rating	Description
C101	QCS11HJ-8R0	8 pF 50 V	Ceramic
C102	QCS31HJ-330Z	33 pF "	"
C103	QCS11HJ-180	18 pF "	"
C104	QCF31HP-103Z	0.01 μF "	"
C105	QCS11HJ-4R0	4 pF "	"
C106	QCT05CH-180	18 pF "	"
C107	QCS31HJ-8R0Z	8 pF "	"
C108	QCS31HJ-151Z	160 pF "	"
C109	QCF31HP-103Z	0.01 μF "	"
C110	QCF31HP-223Z	0.022 μF "	"
C112	QCC31EM-473Z	0.047 μF 25 V	"
C113	QCT05CH-5R0	5 pF 50 V	"
C114	QCT05PH-220	22 pF "	"
C115	QCT05CH-7R0	7 pF "	"
C116	QCT05CH-220	22 pF "	"
C117	QCT05CH-100	10 pF "	"
C118	QCF31HP-223Z	0.022 μF "	"
C119	QCF31HP-223Z	" "	"
C120	QCT05CH-1R0	1 pF "	"
C122	See page 18.		"
C124	QCF31HP-103Z	0.01 μF "	"
C125	QCF31HP-223Z	0.022 μF "	"
C126	QCF21HP-223	" "	"
C127	QCS21HJ-390	39 pF "	"
C149	QET61ER-476Z	47 μF 25 V	Electrolytic
C150	QEZ0046-475	4.7 μF 50 V	N.P. Electrolytic
C151	QEZ0046-105	1 μF "	"
C152	QET61CR-226Z	22 μF 16 V	Electrolytic
C153	QET50JR-227	220 μF 6.3 V	"
C155	QET61ER-106Z	10 μF 25 V	"
C156	QFM31HK-473Z	0.047 μF 50 V	Mylar
C157	QFM31HK-272	2700 pF "	"
C158	QFP31HJ-102	1000 pF "	Polypropyrene
C159	QFM31HK-222Z	2200 pF "	Mylar
C160	QEB51HM-474	0.47 μF "	Low Leak Current Electrolytic
C161	QEB51EM-106	10 μF 25 V	"
C162	QEB51EM-475	4.7 μF "	"
C163	QFM31HK-103	0.01 μF 50 V	Mylar
C164	QET61HR-474Z	0.47 μF "	Electrolytic
C165	QET51HR-474	" "	"
C166	QET61HR-475Z	4.7 μF "	"
C167	QET61HR-475Z	" "	"
C168	QET61ER-106Z	10 μF 25 V	"
C170	QCS31HJ-5R0Z	5 pF 50 V	Ceramic
C172	QCS31HJ-270Z	27 pF "	"
C173	QCS21HJ-331	330 pF "	"
C174	QCS31HJ-150Z	15 pF "	"
C175	QFM31HK-103Z	0.01 μF "	Mylar
C176	QCF31HP-223Z	0.022 μF "	Ceramic
C177	QCF31HP-103Z	0.01 μF "	"
C178	QCF21HP-223	0.022 μF "	"
C179	QCS31HJ-560Z	56 pF "	"
C180	QCF31HP-103Z	0.01 μF "	"
C181	QET61HR-105Z	1 μF "	Electrolytic
C182	QET51CR-226	22 μF 16 V	"
C183	QET51CR-227	220 μF "	"
C184	QCS21HJ-331	330 pF 50 V	Ceramic
C185	QCF31HP-223Z	0.022 μF "	"
C186	QFM31HK-102	1000 pF "	Mylar
C187	QCC21EM-473	0.047 μF 25 V	Ceramic
C188	QET61ER-106Z	10 μF "	Electrolytic
C189	QEB51HM-224	0.22 μF 50 V	Low Leak Current Electrolytic
C190	QFM31HK-103Z	0.01 μF "	Mylar
C191	QET51HR-475	4.7 μF "	Electrolytic
C192	QET51ER-106	10 μF 25 V	"
C193	QET61ER-106Z	10 μF 25 V	Electrolytic
C430	QCC31EM-473Z	0.047 μF "	Ceramic
C431	QCC21EM-473	" "	"
C432	QCC31EM-473Z	" "	"
C433	QET61HR-225Z	2.2 μF 50 V	Electrolytic
C434	QET51ER-106	10 μF 25 V	"
C435	QCF21HP-223	0.022 μF 50 V	Ceramic
C436	QET51HR-105	1 μF "	Electrolytic
C437	QCF21HP-223	0.022 μF "	Ceramic
C438	QET61ER-106Z	10 μF 25 V	Electrolytic
C439	QCC21EM-473	0.047 μF "	Ceramic
C440	QCT26CH-5R0	5 pF 50 V	"
C441	QCT25CH-5R0Z	" "	"
C442	QFM31HJ-223	0.022 μF "	Mylar
C443	QCT26CH-100	10 pF "	Ceramic
C444	QCS21HJ-101	100 pF "	"
C445	QCS21HJ-181	180 pF "	"
C446	QET61HR-475Z	4.7 μF "	Electrolytic
C447	QET61ER-106Z	10 μF 25 V	"
C448	QCF31HP-473Z	0.047 μF 50 V	Ceramic
C449	QEZ0046-475	4.7 μF "	Electrolytic
C450	QCT26UJ-471	470 pF "	Ceramic
C451	QET61HR-105Z	1 μF "	Electrolytic
C452	QCF31HP-473Z	0.047 μF "	Ceramic
C453	QCF31HP-223Z	0.022 μF "	"

Resistors

Item No.	Part Number	Rating	Description
R101	QRD141J-105SY	1 MΩ 1/4 W	Carbon
R102	See page 18.		"
R103	QRD141J-223SY	22 kΩ "	"
R104	QRD141J-392SY	3.9 kΩ "	"
R105	QRD141J-102SY	1 kΩ "	"
R106	QRD141J-820SY	82 Ω "	"
R107	See page 18.		"
R110	QRD141J-274SY	270 kΩ 1/4 W	"
R111	QRD141J-184SY	180 kΩ "	"
R112	QRD141J-103SY	10 kΩ "	"
R113	QRD141J-103SY	" "	"
R114	QRD141J-222SY	2.2 kΩ "	"
R115	QRD141J-331SY	330 Ω "	"
R122	QRD141J-224SY	220 kΩ "	"
R123	QRD141J-221SY	220 Ω "	"
R124	QRD141J-331SY	330 Ω "	"
R125	QRD141J-331SY	" "	"
R126	See page 18.		"
R127	QRD141J-331SY	330 Ω 1/4 W	"
R128	QRD141J-681SY	680 Ω "	"
R129	QRD141J-221SY	220 Ω "	"
R130	QRD141J-101SY	100 Ω "	"
R131	QRD141J-101SY	" "	"
R132	QRD141J-101SY	" "	"
R133	QRD141J-101SY	" "	"
R145	QRD141J-221SY	220 Ω "	"
R146	QRD141J-473SY	47 kΩ "	"
R147	QRD141J-473SY	" "	"
R148	QRD141J-104SY	100 kΩ "	"
R149	QRD141J-104SY	" "	"

Resistors

Item No.	Part Number	Rating		Description
R150	QRD141J-103SY	10 kΩ	1/4 W	Carbon
R151	QRD141J-103SY	"	"	"
R152	QRD141J-104SY	100 kΩ	"	"
R153	QRD141J-564SY	560 kΩ	"	"
R154	QRD141J-271SY	270 Ω	"	"
R155	QRD141J-104SY	100 kΩ	"	"
R156	QRD141J-274SY	270 kΩ	"	"
R157	QRD141J-154SY	150 kΩ	"	"
R158	QRD141J-273SY	27 kΩ	"	"
R159	QRD141J-273SY	"	"	"
R160	QRD141J-333SY	33 kΩ	"	"
R161	QRD141J-183SY	18 kΩ	"	"
R162	QRD141J-183SY	"	"	"
R163	QRD141J-333SY	33 kΩ	"	"
R164	QRD141J-122SY	1.2 kΩ	"	"
R165	QRD141J-122SY	"	"	"
R166	QRD141J-681SY	680 Ω	"	"
R167	QRD141J-183SY	18 kΩ	"	"
R168	QRD141J-183SY	"	"	"
R169	QRD141J-683SY	68 kΩ	"	"
R170	QRD141J-333SY	33 kΩ	"	"
R171	QRD141J-333SY	"	"	"
R172	QRD141J-681SY	680 Ω	"	"
R173	QRD141J-392SY	3.9 kΩ	"	"
R174	QRD141J-183SY	18 kΩ	"	"
R175	QRD141J-273SY	27 kΩ	"	"
R176	QRD141J-271SY	270 Ω	"	"
R177	QRD141J-103SY	10 kΩ	"	"
R178	QRD141J-153SY	15 kΩ	"	"
R179	QRD141J-473SY	47 kΩ	"	"
R181	QRD141J-104SY	100 kΩ	"	"
R182	QRD141J-682SY	6.8 kΩ	"	"
R183	QRD141J-102SY	1 kΩ	"	"
R184	QRD141J-122SY	1.2 kΩ	"	"
R186	QRD141J-392SY	3.9 kΩ	"	"
R187	QRD141J-224SY	220 kΩ	"	"
R188	QRD141J-222SY	2.2 kΩ	"	"
R189	QRD141J-822SY	8.2 kΩ	"	"
R190	QRD141J-682SY	6.8 kΩ	"	"
R191	QVP4A0B-222	2.2 kΩ		Variable
R192	QRD141J-224SY	220 kΩ	1/4 W	Carbon
R193	QRD141J-333SY	33 kΩ	"	"
R194	QRD141J-102SY	1 kΩ	"	"
R195	QVP4A0B-104	100 kΩ		Variable
R196	QRD141J-392SY	3.9 kΩ	1/4 W	Carbon
R197	QRD141J-392SY	"	"	"
R198	QRD141J-333SY	33 kΩ	"	"
R199	QRD141J-333SY	"	"	"
R200	QRD141J-563SY	56 kΩ	"	"
R201	QRD141J-222SY	2.2 kΩ	"	"
R202	QRD141J-183SY	18 kΩ	"	"
R203	QRD141J-220SY	22 Ω	"	"
R204	QRD141J-220SY	"	"	"
R205	QRD141J-220SY	"	"	"
R206	QRD141J-220SY	"	"	"
R207	QRD141J-220SY	"	"	"
R220	QRD141J-152SY	1.5 kΩ	"	"
R221	QRD141J-562SY	5.6 kΩ	"	"
R222	QRD141J-151SY	150 Ω	"	"
R223	QRD141J-221SY	220 Ω	"	"
R224	QRD141J-331SY	330 Ω	"	"
R225	QRD141J-103SY	10 kΩ	"	"
R226	QRD141J-682SY	6.8 kΩ	"	"
R227	QRD141J-103SY	10 kΩ	"	"
R228	QRD141J-103SY	"	"	"
R229	QRD141J-332SY	3.3 kΩ	1/4 W	Carbon
R230	QRD141J-333SY	33 kΩ	"	"
R401	QRD141J-331SY	330 Ω	"	"
R402	QRD141J-154SY	150 kΩ	"	"
R404	QVP4A0B-473	47 kΩ		Variable
R405	See page 18.			Carbon
R406	QRD141J-222SY	2.2 kΩ	1/4 W	"
R407	QRD141J-334SY	330 kΩ	"	"
R408	QRD141J-153SY	15 kΩ	"	"
R409	QRD141J-822SY	8.2 kΩ	"	"
R410	QRD141J-222SY	2.2 kΩ	"	"
R411	QRD141J-682SY	6.8 kΩ	"	"
R412	QRD141J-562SY	5.6 kΩ	"	"
R413	QRD141J-102SY	1 kΩ	"	"
R414	QRD141J-183SY	18 kΩ	"	"
R415	QRD141J-123SY	12 kΩ	"	"
R416	QRD141J-154SY	150 kΩ	"	"
R417	QRD141J-683SY	68 kΩ	"	"
R418	QRD141J-472SY	4.7 kΩ	"	"
R419	QRD141J-122SY	1.2 kΩ	"	"
R420	QRD148J-123	12 kΩ	"	"

Others

Item No.	Part Number	Rating	Description
	See page 18.		Antenna Terminal
	E10373-001		Printed Circuit Board
	E300236-001		LED Escutcheon
	E60091-002		Shield Plate
	E60092-002		"
	E60700-001		Grounding Plate
	QAA2246-001		Tuning Gang Capacitor
	QMV5005-012		12 Pin Plug Assembly
CF101	E03357-009		Ceramic Filter for FM IF
CF102	E03613-006		"
CF103	E03357-009		"

7-(2) TXX-194B (or C,D,E,FBS) Power Supply and Switches P.C.Board Ass'y

The P.C. Board number varies according to the designated area as follows.

P.C. Board Ass'y	TXX-194 B -1 (or 4)	TXX-194 C -1 (or 4)	TXX-194 D -1 (or 4)	TXX-194 E -1 (or 4)	TXX-194 FBS -1 (or 4)
Area	U.S.A.	Canada	U.S. Military Market and Other Countries	Europe	U.K. and Australia

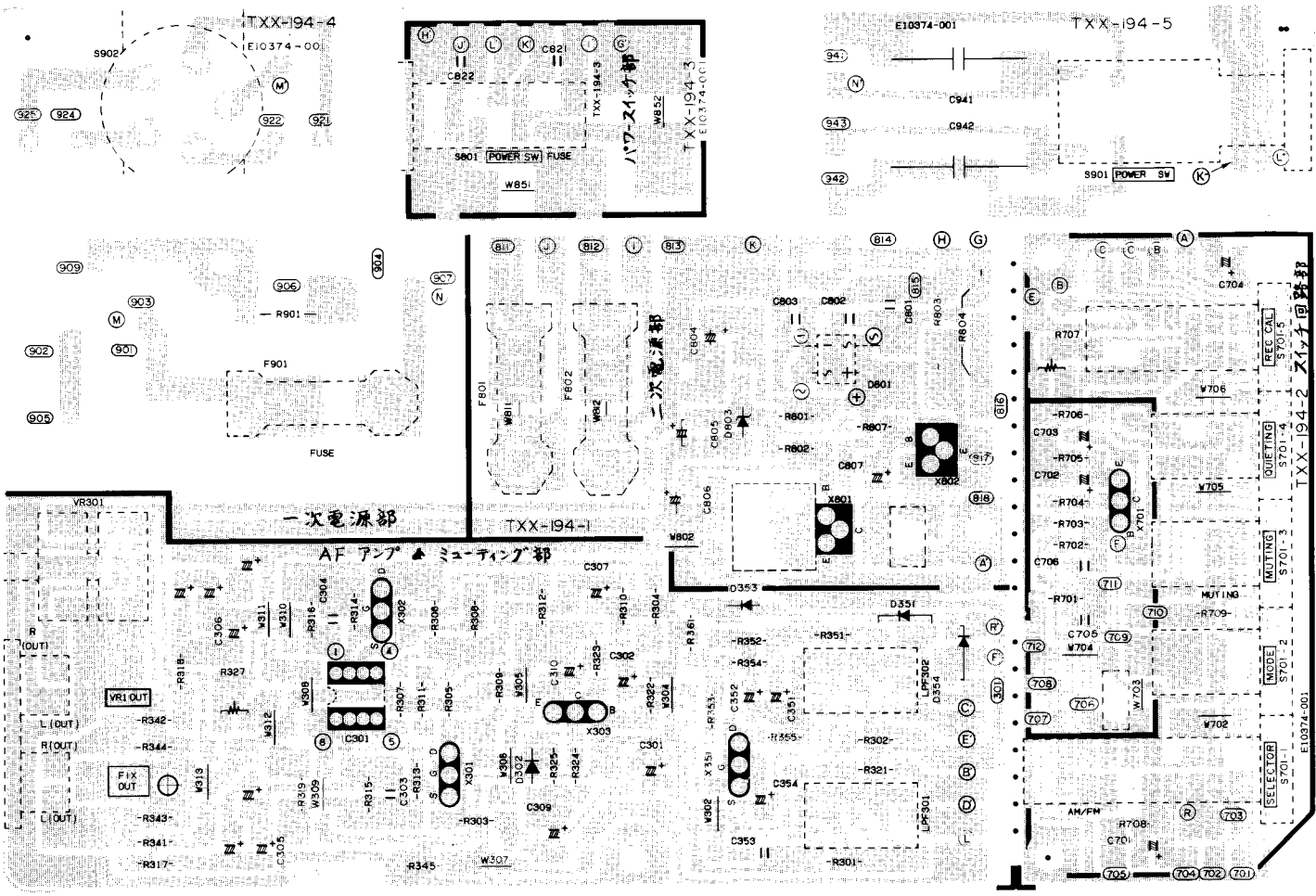
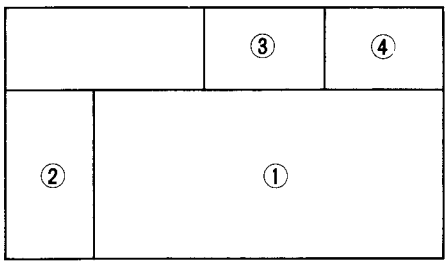


Fig. 18



Each Individual P.C. Board location

① TXX-194□-1 : Power Supply P.C. Board Ass'y
② TXX-194-2 : Function & Select Switch P.C. Board Ass'y
③ TXX-194-3 : Power Switch P.C. Board Ass'y
④ TXX-194□-4 : Voltage Selector P.C. Board Ass'y

Note:
The specific symbols (赤 , 黒 , 白 . . . etc.) on a surface of P.C. Board are actually un-related to the repair service and are significant denotement in order to process the proper assembly of P.C. Board at the factory.

Transistors

Item No.	Part Number	Rating		Description	Maker
		Pc	fT		
X301	2SK105(E, F)	0.25 W		J. FET	NEC
X302	2SK105(E, F)	"		"	"
X303	2SC458(D)	0.2 W	230 MHz	Silicon	Hitachi
X351	2SK105(F)	0.25 W		J. FET	NEC
X701	2SC458(D)	0.2 W	230 MHz	Silicon	Hitachi
X801	2SD330V(E)	20 W	8 MHz	"	Sanyo

Integrated Circuits

Item No.	Part Number	Rating	Description	Maker
		Pc		
IC301	NJM4558D	0.5 W	I.C.	JRC

Diodes

Item No.	Part Number	Rating	Description	Maker
D302	1S2076-31		Silicon	Hitachi
D351	1S2076-31		"	"
D353	1S2076-31		"	"
D354	1S2076-31		"	"
D801	ESAB03-02A		"	Fuji Denki
D803	XZ-132	12.5 V, 0.5 W	"	JRC

Capacitors

Item No.	Part Number	Rating		Description
C301	QET51HR-475	4.7 μF	50 V	Electrolytic
C302	QET51HR-475	"	"	"
C303	See page 18.			Mylar
C304	See page 18.			"
C305	QET51HR-475	"	"	Electrolytic
C306	QET51HR-475	"	"	"
C307	QET51HR-105	1 μF	"	"
C309	QET51CR-476	47 μF	16 V	"
C310	QET51HR-474	0.47 μF	50 V	"
C351	QET51HR-475	4.7 μF	"	"
C352	QET51HR-474	0.47 μF	"	"
C353	QFM31HK-473	0.047 μF	"	Mylar
C354	QEB51HM-224	0.22 μF	"	Low Leak Current Electrolytic
C701	QET51HR-105	1 μF	"	Electrolytic
C702	QEB51EM-475M	4.7 μF	25 V	Low Leak Current Electrolytic
C703	QET51HR-474	0.47 μF	50 V	"
C704	QET51CR-476	47 μF	16 V	"
C705	QFM31HK-103	0.01 μF	50 V	Mylar
C706	QFM31HK-103	"	"	"
C801	QCF21HP-223	0.022 μF	"	Ceramic
C802	QCF21HP-223	"	"	"
C803	QCF21HP-223	"	"	"
C804	QET51ER-228	2200 μF	25 V	Electrolytic
C805	QET51CR-477	470 μF	16 V	"
C806	QET51CR-227	220 μF	"	"
C822	QCF21HP-223	0.022 μF	50 V	Ceramic

Resistors

Item No.	Part Number	Rating		Description
R301	QRD141J-103SY	10 kΩ	1/4 W	Carbon
R302	QRD141J-103SY	"	"	"
R303	QRD141J-472SY	4.7 kΩ	"	"
R304	QRD141J-472SY	"	"	"
R305	QRD141J-273SY	27 kΩ	"	"
R306	QRD141J-273SY	"	"	"
R307	QRD141J-102SY	1 kΩ	"	"
R308	QRD141J-102SY	"	"	"
R309	QRD141J-103SY	10 kΩ	"	"
R310	QRD141J-103SY	"	"	"
R311	QRD141J-105SY	1 MΩ	1/4 W	Carbon
R312	QRD141J-105SY	"	"	"
R313	QRD141J-821SY	820 Ω	"	"
R314	QRD141J-821SY	"	"	"
R315	QRD141J-473SY	47 kΩ	"	"
R316	QRD141J-473SY	"	"	"
R317	QRD141J-221SY	220 Ω	"	"
R318	QRD141J-221SY	"	"	"
R319	QRD141J-472SY	4.7 kΩ	"	"
R321	QRD141J-184SY	180 kΩ	"	"
R322	QRD141J-274SY	270 kΩ	"	"
R323	QRD141J-223SY	22 kΩ	"	"
R324	QRD141J-184SY	180 kΩ	"	"
R325	QRD141J-273SY	27 kΩ	"	"
R327	QVP4AOB-223	22 kΩ		Variable
R341	QRD141J-332SY	3.3 kΩ	1/4 W	Carbon
R342	QRD141J-332SY	"	"	"
R343	QRD141J-332SY	"	"	"
R344	QRD141J-332SY	"	"	"
R345	QRD141J-334SY	330 kΩ	"	"
R351	QRD141J-563SY	56 kΩ	"	"
R352	QRD141J-563SY	"	"	"
R353	QRD141J-563SY	"	"	"
R354	QRD141J-104SY	100 kΩ	"	"
R355	QRD141J-123SY	12 kΩ	"	"
R361	QRD141J-104SY	100 kΩ	"	"
R701	QRD141J-562SY	5.6 kΩ	"	"
R702	QRD141J-563SY	56 kΩ	"	"
R703	QRD141J-153SY	15 kΩ	"	"
R704	QRD141J-103SY	10 kΩ	"	"
R705	QRD141J-332SY	3.3 kΩ	"	"
R706	QRD141J-273SY	27 kΩ	"	"
R707	QVP4AOB-103	10 kΩ		Variable
R708	QRD141J-103SY	"	1/4 W	Carbon
R709	QRD141J-273SY	27 kΩ	"	"
R801	QRD141J-102SY	1 kΩ	"	"
R802	QRD141J-101SY	100 Ω	"	"
R803	See page 18.			
R804	QRG017J-150S	15 Ω	1 W	Oxide Metal Film
R901	See page 18.			Composition

Others

Item No.	Part Number	Rating	Description
	E03591-41F		Output Signal Jacks
	E10374-101		Printed Circuit Board
	See page 18.		Fuse Holder
	E61537-002		Heat Sink for X801
	See page 18.		Holder for Voltage Selector
S701	QSP0259-106		Switch for Signal
S801	QSP0219-018		Power Switch
S902	See page 18.		Voltage Selector
LP301	E03427-014		Low-pass Filter (LPF)
LP302	E03427-014		Low-pass Filter (LPF)
VR301	QVC3A2B-014V		Variable Resistor for Output Level

8. Packing Materials and Part Numbers

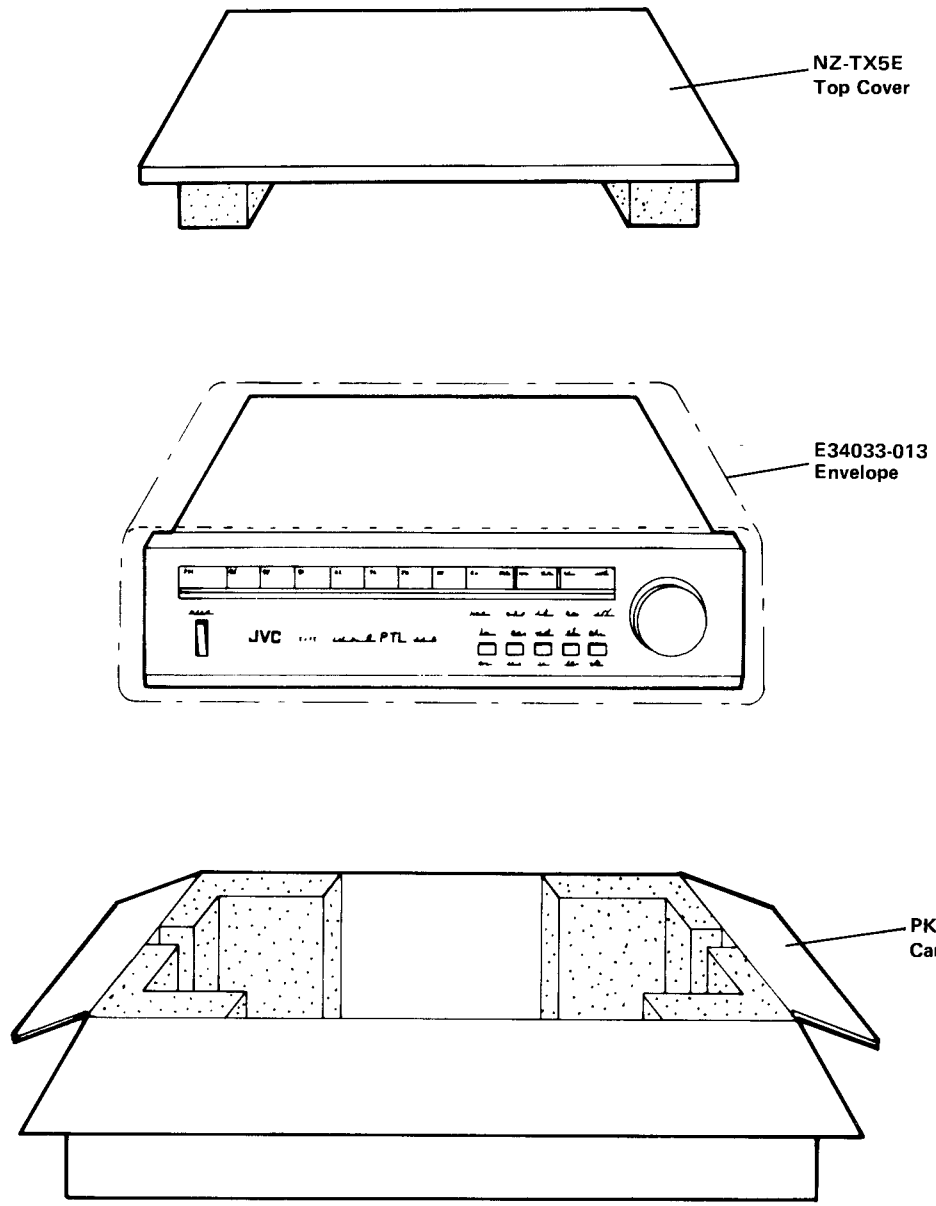
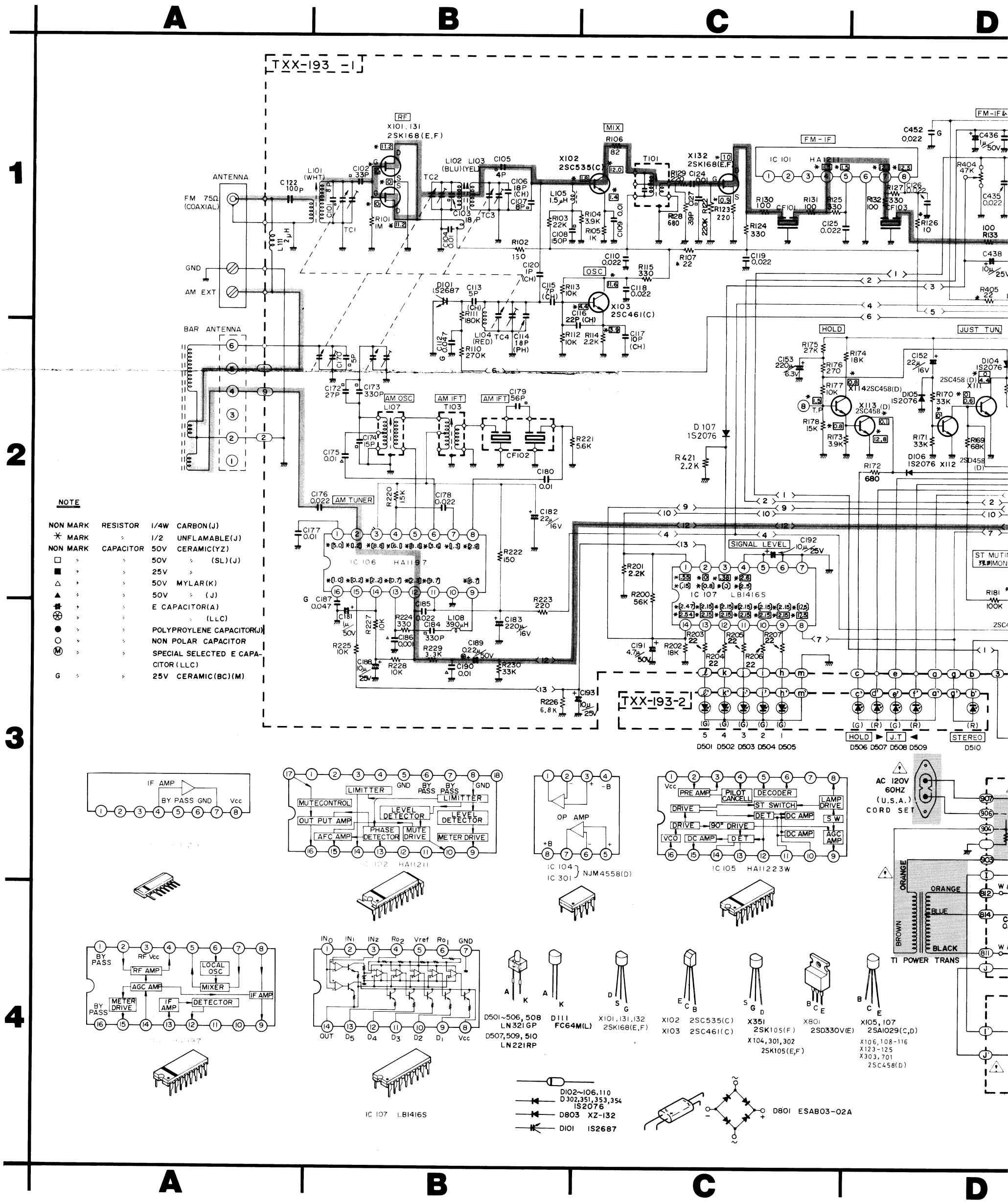


Fig. 19

9. Accessories List

Part Number	Description	Q'ty
See page 18.	Power Cord	1
See page 18.	Instruction Book	1
See page 18.	Warranty Card	1
See page 18.	Connector	1
E03479-001	Signal Cord	1
E41202-2	Envelope for Instruction Book	1
See page 18.	Service procedures	1
See page 18.	Spe. Reply Card	1
Q04141-3J	Vinyl Tie	1
See page 18.	Caution Sheet	1
See page 18.	Siemens Plug	1
See page	Warning Label	1

10. T-X5 Schematic Diagram



Printed Circuit Board Ass'y Locations

P.C. Board Ass'y	Description	Page
TXX-193B (or C)	FM/AM Tuner and LED P.C. Board Ass'y	9
TXX-194B (or C,D,E,FBS)	Power Supply and Switches P.C. Board Ass'y	13

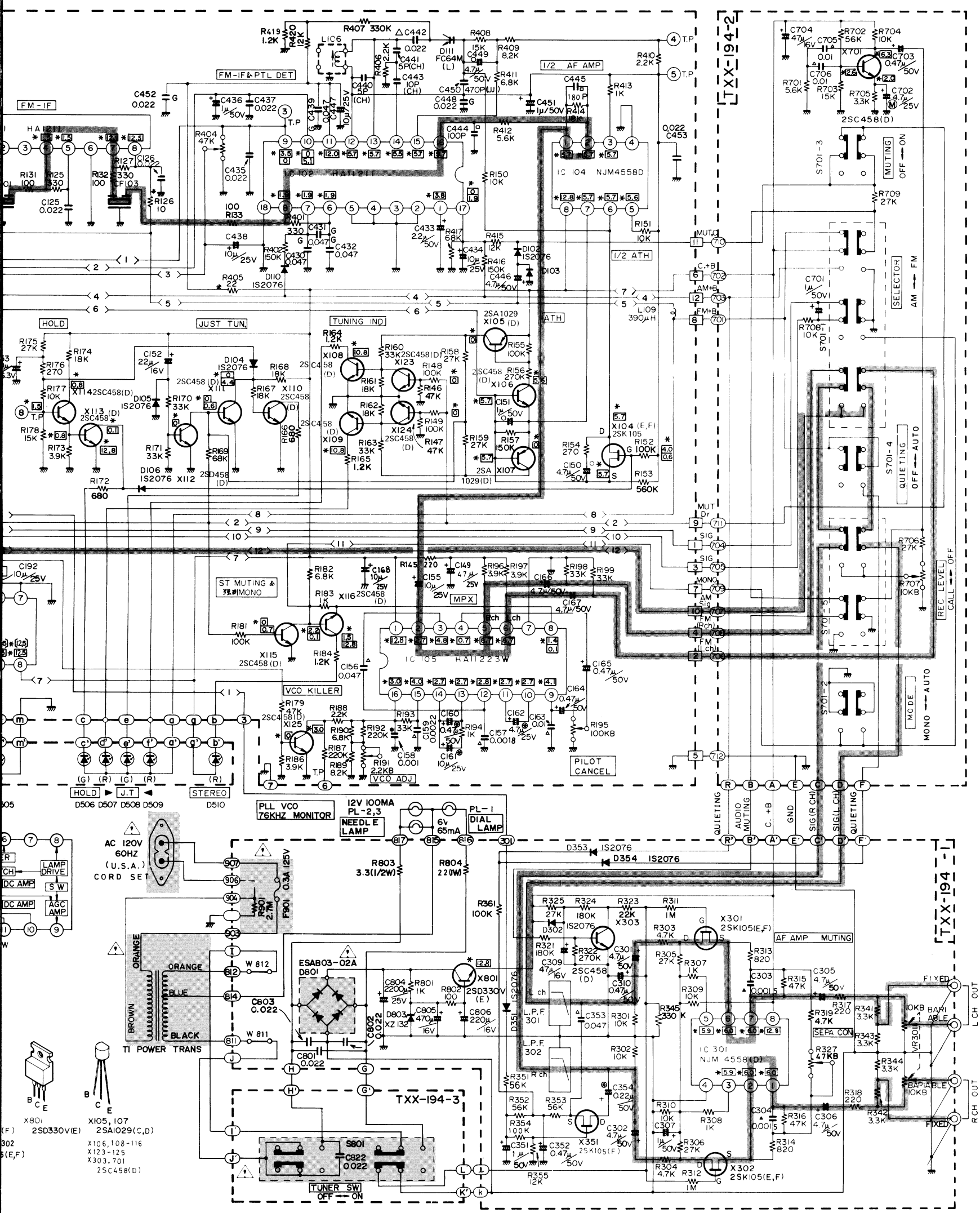
1. R107 and 405 are 0 Ω, R126 is 220 Ω for E, A and BS. R102 should be elevated from the board with a spanner.
2. L111 and C122 are additional items only for E, A and BS.
3. R803 is 0 Ω for U, P, E, A and BS.
4. C303 and 304 are 0.001 μF for E, A and BS.

Note

1. Voltage values *▭ are measured with a tester (impedance 20 kΩ/V) during FM reception.
2. Voltage values *( ) are measured with a tester (impedance 20 kΩ/V) during AM reception.

How to util

1. —— inc
2. ▬ inc
3. Voltage during A No signa AM
4. Control white ch Examp
5. When re designate



How to utilize the circuit diagram

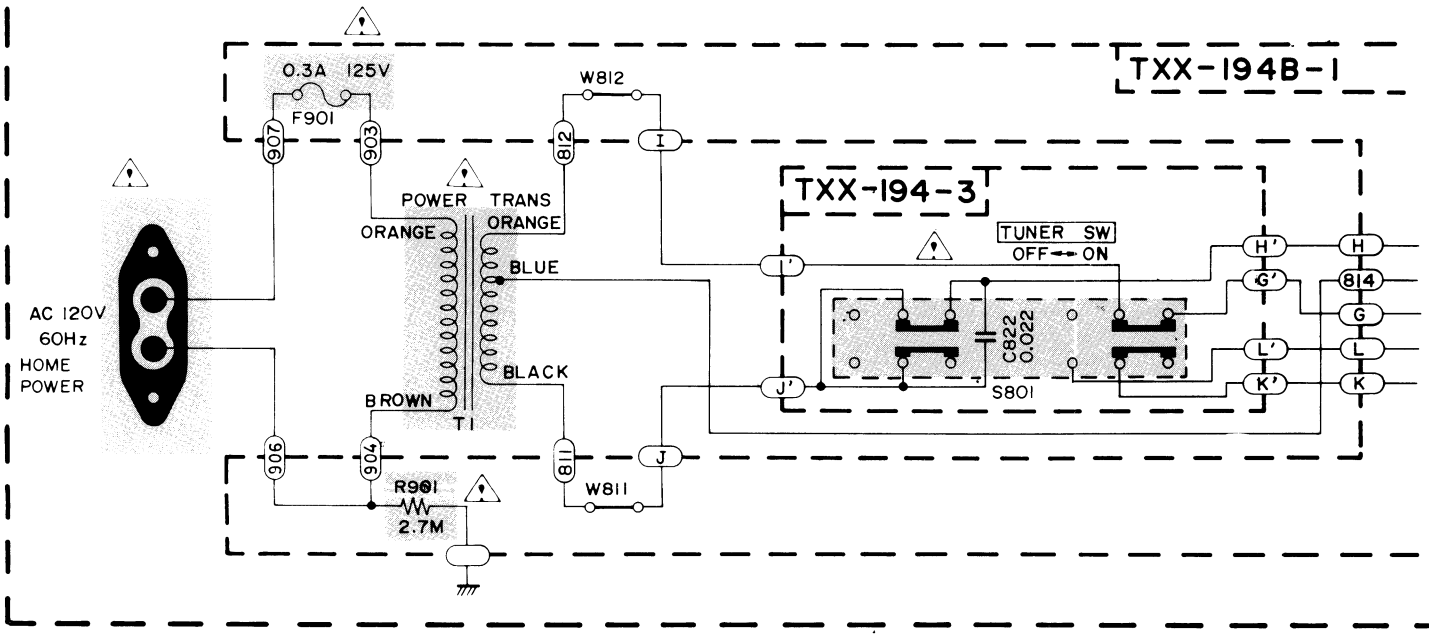
1. —— indicates positive B power supply.
2. ▬ indicates the signal path.
3. Voltage values measured with a tester (impedance 20 kΩ/V) during AM and FM reception are indicated as below:
   No signal example [5.7] (unit: V)
   AM example (2.5) (unit: V)
4. Control resistors are indicated, for easy reference, with white characters on a black background;
   Example VCO control
5. When replacing the ⚠ marked parts, be sure to use the designated parts to ensure safety.
6. Resistors are indicated as follows;
   *Unit No indication : Ω
   K : kΩ
   M : MΩ
   W : watt
7. Capacitors are indicated as follows;
   *Unit No indication : μF
   μ : μF
   P : pF
8. This is the standard circuit diagram. The design and contents are subject to change without notice.

T-X5
No. 2468

The schematic diagram shown seet is for the U.S.A.
The primary circuit and deemphasis circuit are different from the diagram for other c

T-X5 (J) FOR U.S.A.

PRIMARY CIRCUIT : AC 120V 60Hz.
DEEMPHASIS : 75μSEC (USE TXX-194B)



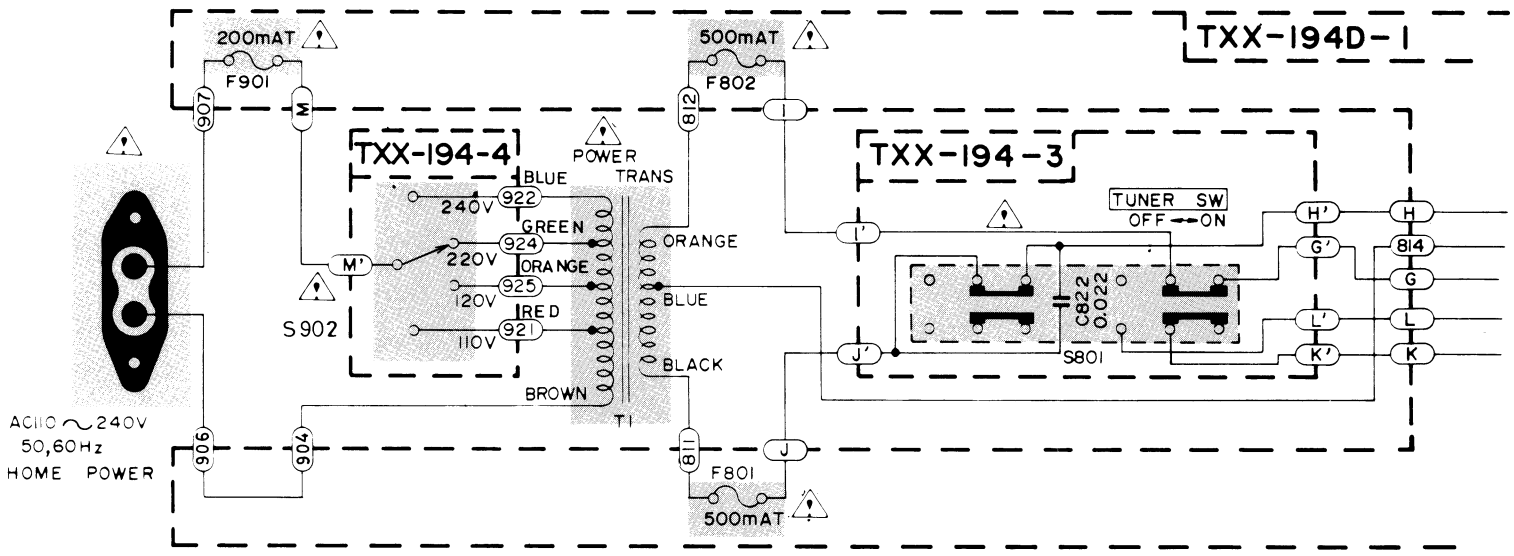
USED CIRCUIT BOARD

TXX-193B
- TXX-193B-1
- TXX-193-2

TXX-194B
- TXX-194B-1
- TXX-194-2
- TXX-194-3

T-X5 (U) FOR UNIVERSAL USE & (P) FOR PACEX

PRIMARY CIRCUIT : SELECTABLE 110/120/220/240V 50/60Hz.
DEEMPHASIS : 75μSEC (USE TXX-194D)
VOLTAGE SELECTOR (S902 MOUNTED ON THE REAR PANEL) MUST BE ADJUSTED FOR THE PROPER VOLTAGE OF HOME POWER.



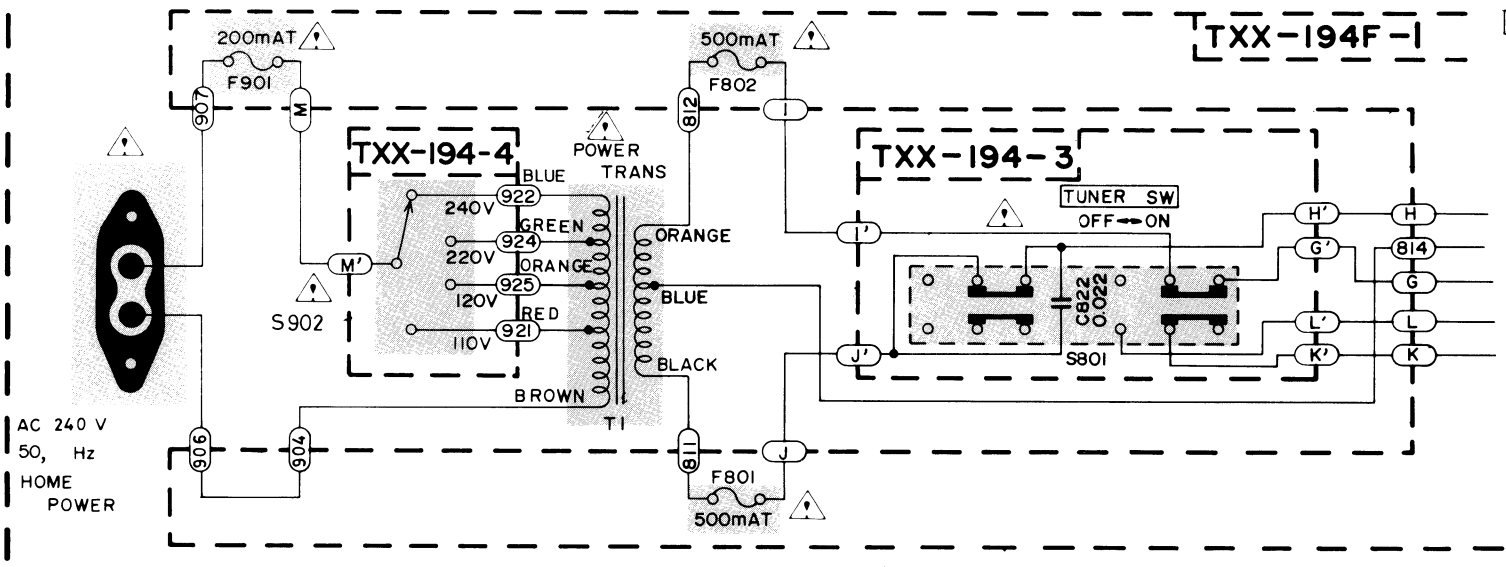
USED CIRCUIT BOARD

TXX-193B
- TXX-193B-1
- TXX-193-2

TXX-194D
- TXX-194D-1
- TXX-194-2
- TXX-194-3
- TXX-194-4

T-X5 (BS) FOR UNITED KINGDAM

PRIMARY CIRCUIT : SELECTABLE AC 110/120/220/240V ~ 50Hz.
DEEMPHASIS : 50μSEC (USE TXX-194F)
VOLTAGE SELECTOR (S902 MOUNTED ON THE REAR PANEL) IS SET FOR 240V HOME POWER.



USED CIRCUIT BOARD

TXX-193B
- TXX-193B-1
- TXX-193-2

TXX-194F
- TXX-194F-1
- TXX-194-2
- TXX-194-3
- TXX-194-4

AC INLET
(SOT-15)

Note: 1. When replacing the ⚠ marked parts, be sure to use the designated parts to ensure safety.

2. This is the standard circuit diagram. The design and contents are subject to change without notice.

S.A.
different from the diagram for other areas, therefore please use the proper schematic diagram shown below.

UIT BOARD

3B-1
3-2

4B-1
4-2
4-3

HOME POWER.

CIRCUIT BOARD

X-193B
TXX-193B-1
TXX-193-2

-194D
XX-194D-1
XX-194-2
XX-194-3
XX-194-4

RCUIT BOARD

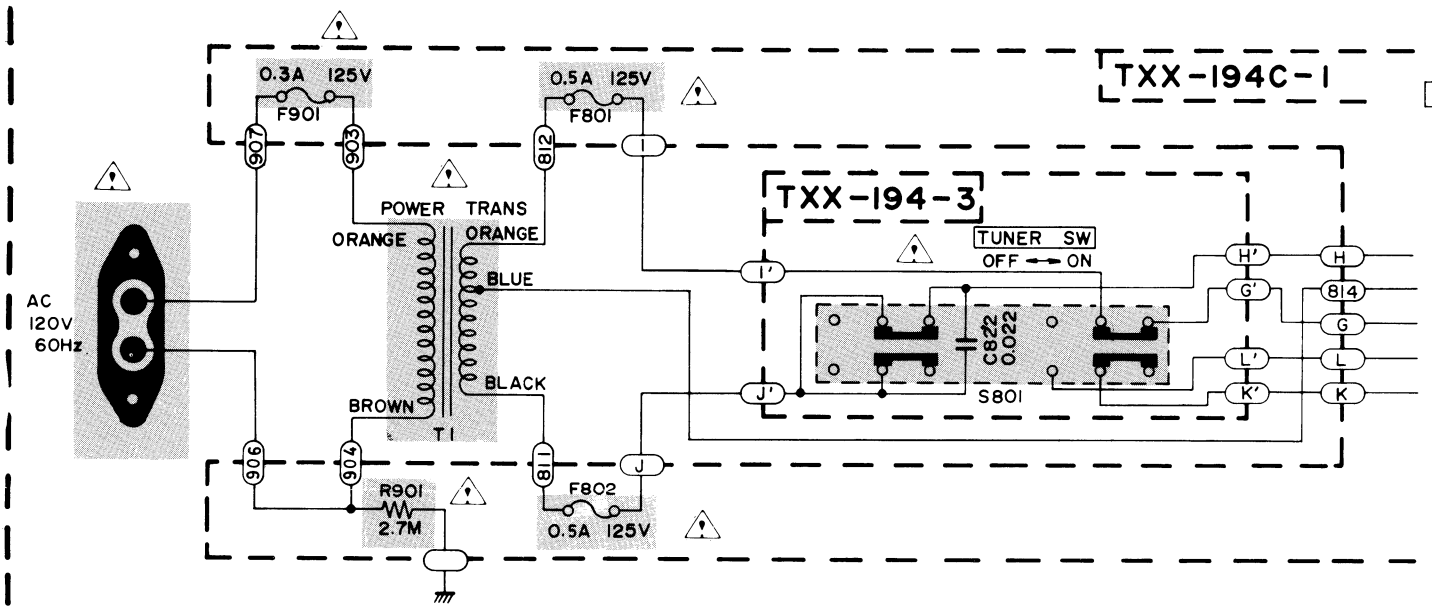
3B
-193B-1
-193-2

4F
-194F-1
-194-2
-194-3
-194-4

nts

T-X5 (C) FOR CANADA

PRIMARY CIRCUIT : AC 120V 60Hz.
DEEMPHASIS : 75μSEC (USE TXX-194C)



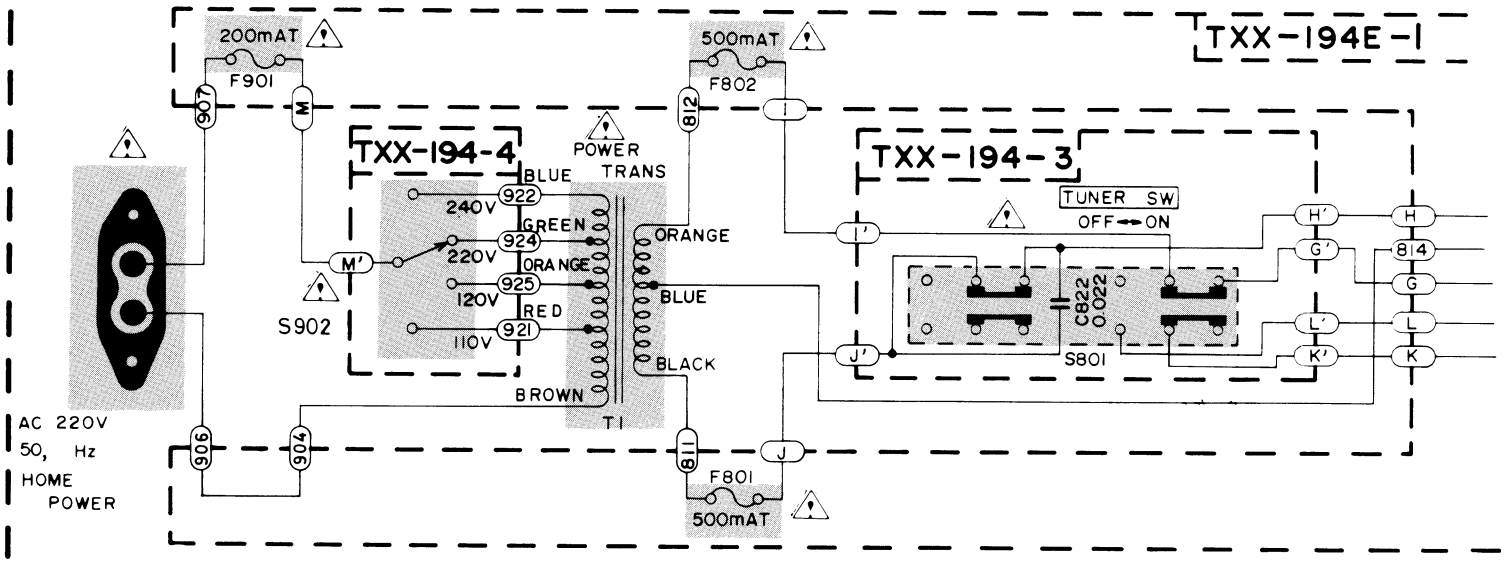
USED CIRCUIT BOARD

TXX-193B
{TXX-193B-1
TXX-193-2

TXX-194C
{TXX-194C-1
TXX-194-2
TXX-194-3

T-X5 (E) FOR EUROPE & (A) FOR AUSTRALIA

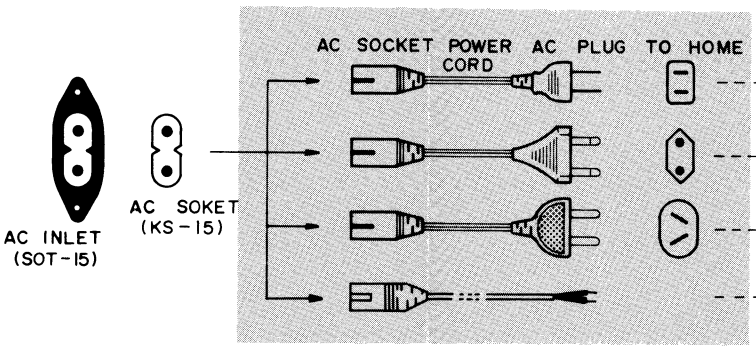
PRIMARY CIRCUIT : SELECTABLE AC 110/120/220/240V ~ 50Hz.
DEEMPHASIS : 50μSEC (USE TXX-194E)
VOLTAGE SELECTOR(S902 MOUNTED ON THE REAR PANEL) IS SET FOR 220V HOME POWER.



USED CIRCUIT BOARD

TXX-193B
{TXX-193B-1
TXX-193-2

TXX-194E
{TXX-194E-1
TXX-194-2
TXX-194-3
TXX-194-4



11. Parts List with Specified Numbers for Designated Areas

Item No.	Description	For U.S.A. and Canada	For Europe and Australia	For U.K.	For U.S. Military Market and Other Countries
	Rear Panel	E23125-002	E23125-003	E23125-003	E23125-003
T1	Power Transformer	E03042-23B	E03042-23D	E03042-23DBS	E03042-23D
F901	Fuse (Primary)	QMF61U1-R30 (0.3 A)	QMF51A2-R20L (200 mAT)	QMF51A2-R20LBS (200 mAT)	QMF51A2-R20L (200 mAT)
F801, 802	Fuse (Secondary)	QMF61U1-R50 (0.5 A) (only for Canada)	QMF51A2-R50L (500 mAT)	QMF51A2-R50LBS (500 mAT)	QMF51A2-R50L (500 mAT)
	AC Inlet	QMC0239-002	QMC0239-002	QMC0239-002BS	QMC0239-002
	Voltage Selector	–	TXX-194(E)-4	TXX-194(F)-4BS	TXX-194(D)-4
	P.C. Board Ass'y				
R102	Resistor (Carbon)	QRD141J-151SY	QRD141J-151S	QRD141J-151S	QRD141J-151SY
R107	Resistor (Carbon)	QRD129J-220	Shorted	Shorted	QRD129J-220
R126	Resistor (Carbon)	QRD129J-100	QRD129J-221	QRD129J-221	QRD129J-100
R405	Resistor (Carbon)	QRD129J-220	Shorted	Shorted	QRD129J-220
C122	Capacitor (Ceramic)	–	QCS31HJ-101Z	QCS31HJ-101Z	–
L111	Choke Coil	–	E03695-001	E03695-001	–
	Antenna Terminal	E03572-019F	E03572-019P	E03572-019P	E03572-019F
C303, 304	Mylar	QFM31HJ-152	QFM31HJ-102	QFM31HJ-102	QFM31HJ-152
R803	Resistor (Carbon)	QRD129J-3R3	Shorted	Shorted	Shorted
R901	Resistor (Composition)	QRC121K-275EM			
	6 pcs. for Fuse Holder	E45524-002 (2 pcs. only for the U.S.)	E48965-002	E48965-002	E48965-002
	Voltage Selector	–	QSR0074-001	QSR0074-001BS	QSR0074-001
	Holder for Voltage Selector	–	E66342-001	E66342-001	E66342-001
	Power Cord with Plug	QMP1230-183	QMP3950-183 (for Europe) QMP2530-200 (for Australia)	QMP9017-009BS	QMP7630-183
	Instruction Book	E30580-738A	E30580-738A	E30580-738ABS	E30580-738A
	Warranty Card	BT20032 (for U.S.A.) BT20025C (for Canada)	BT20029 (only for Australia)	BT20013B	BT20014B
	Connector	E47746-005	–	–	E47746-005
	Service Pro.	BT20023 (only for the U.S.A.)	–	–	–
	Spe. Reply Card	BT20024B (only for the U.S.A.)	–	–	–
	Warning Label	–	–	E60965-001BS	–
	Siemens Plug	–	–	–	E04056
	Caution Sheet	–	E60932-002 (for Europe) E60932-003 (for Australia)	E60932-003	–